

ANHYDROUS AMMONIA MASTER WORK SHEET

HAZ -MAT PRODUCT WORK SHEET

DATE:	LOCATION:	INCIDENT #:	REFERENCE:	PAGE #
PRODUCT NAME: Anhydrous Ammonia	TRADE NAME:	SYNONYMS:	Ammonia	
UN HAZARD CLASS # 2.2 I.D. # 1005	CAS # 7664-41-7	Ammonia Gas		
L.P.A. REG #	E.P.A. EST #	STCC # 4904210		
CHEMICAL PROPERTIES				
NFPA 7-0-4				
BOILING POINT: -28 ° F	GAS	LIQUID		
	H: 2	3		
FLASH POINT:	F: 1	1	SOLID: LIQUID: X CAS: X	OTHER: Poison Gas
	R: 0	0	VAPOR: DUST:	Clear Colorless Gas
IGN TEMP 1204 ° F	MANUFACTURER:			
FLAMMABLE RANGE: 16% -25%	SHIPPER:			
SPECIFIC GRAVITY: .682	CARRIER:			
VAPOR DENSITY: .59	VEHICLE I.D. #			
WATER SOLUBILITY: Yes	DECON SOLUTION:			
EXPANSION RATIO:				
PROTECTIVE EQUIPMENT: Level A Encapsulated				
EPA LEVEL: A				
RECOMMENDED MATERIAL: Butyl Rubber, Natural Rubber, Neoprene, Nitrile Rubber, PVC				
EXTINGUISHING EQUIPMENT:	Keep vapors down with water spray			
Carbon Dioxide, Dry Chemical, Water Fog, or Foam for large fires				
FIRST AID:	Remove to fresh air, maintain O ₂ supplement, flush skin with water for 15 minutes if exposed			
HEALTH HAZARDS: Causes Frostbite, form corrosive liquid, causes breathing difficulty				
*Explosive				



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Material Safety Data Sheets Collection:

Sheet No. 1
Anhydrous Ammonia

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Section 1. Material Identification

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Anhydrous Ammonia Description: Manufactured primarily by using atmospheric nitrogen and a hydrogen source at high temperatures (752 °F/400 °C to 11,732 °F/6500 °C) and pressures (100 to 900 atm) in the presence of an iron catalyst (a modified Haber reduction process). Used as a refrigerant, a fertilizer, a cleaning and bleaching agent, a household cleaner, a condensation catalyst, a neutralizing agent in the petroleum industry, and a yeast nutrient; in nitriding of steel, developing diazo films, manufacturing nitric acid, synthetic fibers, and explosives; and in latex preservatives, dyeing, ureaformaldehyde, nitrocellulose, nitroparaffins, melamine, ethylenediamine, fuel cells, sulfite cooking liquors, and rocket fuel.

Other Designations: CAS No. 7664-41-7; NH₃; ammonia (ACGIH); ammonia anhydrous.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*^(TM) for a suppliers list.

NFPA	
Gaseous	Liquified
R 1	HMIS
I 3	H 3
S 4	F 0
K -	R 0
	PPG*
	* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Anhydrous ammonia, ca 100%

OSHA PEL

15-min STEL: 35 ppm, 27 mg/m³

ACGIH TLVs, 1989-90

TLV-TWA: 25 ppm, 17 mg/m³

TLV-STEL: 35 ppm, 24 mg/m³

NIOSH REL, 1987

50 ppm

5-min ceiling: 35 mg/m³

Toxicity Data*

Human, eye: 700 ppm

Human, inhalation: 20 ppm inhaled affects the sense organs, special senses (conjunctiva irritation, ulcerated nasal septum), and the lungs, thorax, and respiration (change in trachea or bronchi)

* See NIOSH, RTECS (BO0875000), for additional irritative, mutative, and toxicity data.

Section 3. Physical Data

Boiling Point: -28.03 °F/-33.35 °C

Melting Point: -107.9 °F/-77.7 °C

Vapor Pressure: 10 atm at 78.3 °F/25.7 °C

Vapor Density (Air = 1): 0.6

Molecular Weight: 17.03 g/mol

Specific Gravity (H₂O = 1 at 39 °F/4 °C): 0.77 at 32 °F/0 °C (liquid), 0.7 at -27 °F/-33 °C (gas)

Water Solubility: 47% at 32 °F/0 °C, 34% at 68 °F/20 °C

Appearance and Odor: Colorless liquid or gas with a strong, pungent, and irritating odor. Their low and high odor thresholds are 0.0266 mg/m³ and 39.6000 mg/m³, respectively.

Section 4. Fire and Explosion Data

Flash Point: Gas at room temperature

Autoignition Temperature: 1204 °F/ 651 °C (iron catalyzed)*

LEL: 16% v/v

UEL: 25% v/v

Extinguishing Media: An explosive mixture may form in air if this gas continues to flow while the flame is extinguished. Thus the best procedure is first to stop the flow of gas. It may be necessary to use carbon dioxide or dry chemical to extinguish the flame surrounding the valve that controls the gas supply. Use water to cool fire-exposed containers and to protect personnel shutting off gas. The water reduces gas concentration due to its solubility in water. For fires involving liquified anhydrous ammonia, use dry chemical or CO₂.

Unusual Fire or Explosion Hazards: This material is a moderate fire and explosion hazard when exposed to heat and/or flame. The presence of oil and other combustible materials increases the fire hazard.

Special Fire-fighting Procedures: Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. If gas is leaking or tanks are exposed to intense heat, evacuate the area and the area downwind. Tanks should be equipped with appropriate pressure-relief devices. Violent rupture can occur if relief valves fail. Stay clear of tank heads. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

* 850 °C/1562 °F (uncatalyzed).

Section 5. Reactivity Data

Stability/Polymerization: Anhydrous ammonia is stable at room temperature in closed containers under normal storage and handling conditions. Its decomposition to flammable hydrogen and nitrogen gas begins above 840 °F/450 °C. Hazardous polymerization cannot occur.

Chemical Incompatibilities: This material is an alkaline gas that gives off heat when it reacts with acids. Contact with interhalogens, boron halides, 1,2-dichloroethane (with liquid NH₃), ethylene oxide (polymerization reaction), chloroformamidinium nitrate, oxygen + platinum, magnesium perchlorate, nitrogen trichloride, and strong oxidants can cause potentially violent or explosive reactions. Contact with heavy metals and their compounds, chlorine azide, bromine, iodine, iodine + potassium, tellurium halides, pentaborane (9), silver oxide, silver chloride, silver nitrate, silver azide, and hypochlorites yield explosive products. Contact with chlorine or chlorine bleach can cause the evolution of hazardous chloramine gas. Ammonia forms sensitive explosive mixtures with air + hydrocarbons, germanium derivatives, stibine, 1-chloro-2,4-dinitrobenzene, ethanol + silver nitrate, and 2-, or 4-chloronitrobenzene (above 160 °C/30 bar). This material is also incompatible with acetaldehyde, acrolein, boron, chlorosilane, hexachloromelamine, sulfur, hydrazine + alkali metals, potassium ferricyanide, potassium mercuric cyanide, nitrogen dioxide, phosphorus pentoxide, and tetramethylammonium amide.

Hazardous Products of Decomposition: Thermal oxidative decomposition of anhydrous ammonia can produce toxic fumes of ammonia (NH₃) and nitrogen oxides (NO_x).

Section 6. Health Hazard Data

Carcinogenicity: Neither the NTP, IARC, nor OSHA lists anhydrous ammonia as a carcinogen.

Summary of Risks: Ammonia gas can be suffocating and extremely irritating to the eyes, throat, and respiratory tract. Depending on exposure level and time, effects range from mild irritation to severe corrosion of body tissue due to ammonia's alkalinity. Exposures to increasing concentrations may be hazardous since persons acclimated to its odors may suffer overexposure and adverse health effects. Intense exposure can be fatal. Fatalities may occur from exposure to ammonia concentrations of 2500 to 4500 ppm for 30 min. 700 ppm causes eye irritation. High gas concentrations can burn and blister skin and cause severe eye irritation with permanent corneal damage. Contact with liquid anhydrous ammonia can also severely burn the eyes and skin. Extensive burns can be fatal.

Medical Conditions Aggravated by Long-Term Exposure: Permanent eye damage, scars, and pulmonary impairment.

Target Organs: Respiratory system, eyes.

Primary Entry Routes: Inhalation, ingestion, skin and eye contact.

Acute Effects: Inhalation can cause dyspnea, bronchospasm, mucosal burns of the nose, pharynx, and larynx (throat irritation at 408 ppm and laryngospasm at 1700 ppm); chest pain; pulmonary edema; saliva secretion; pink, frothy sputum; and urine retention. Ingestion causes nausea, vomiting, and swelling of the lips, mouth, and larynx. Skin contact with concentrated ammonia produces liquefaction necrosis (tissue death) and deep penetrating burns. Eye exposure results in lacrimation, conjunctivitis, iritis, corneal irritation, and temporary or permanent blindness.

Chronic Effects: Chronic bronchiectasis with small airway obliteration may occur. Interstitial fibrosis has been observed after chronic exposure.

FIRST AID

Eyes: Flush immediately, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 min. Time is the most important consideration! *The first 10 seconds are critical to preventing blindness.*

Skin: Quickly remove contaminated clothing. After rinsing affected skin with flooding amounts of water, wash it with soap and water.

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, neither induce vomiting nor attempt to neutralize. Have the conscious person drink about 4 oz of water or milk to dilute. Caution! Excessive amounts may cause vomiting.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Physician's Note: Serum ammonia levels are not clinically useful in managing exposures; instead, evaluate clinically for pulmonary edema and respiratory distress, with treatment as appropriate. Consider esophagoscopy if the patient has oral or pharyngeal burns. Do not induce gastric lavage. Steroid treatment is controversial and of questionable benefit. If ingestion is significant, observe for development of esophageal stricture. For eye exposures, irrigate until conjunctival sac pH is <8.5.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Design and practice an anhydrous ammonia spill control and countermeasure plan (SCCP). Notify safety personnel, evacuate all unnecessary personnel, remove all heat and ignition sources, and ventilate area to disperse gas. Cleanup personnel should protect against vapor inhalation and skin contact. Before fixing a leak, use a water spray to reduce the concentration of gaseous ammonia around a leaking vessel. If a cylinder is the source of a leak, remove it to a safe place in open air. Then, either repair the leak or allow the cylinder to empty. If ammonia is liquified, isolate the hazard area and allow it to vaporize. Rapid neutralization of large amounts of ammonia is not advised since the heat generated may increase exposure of personnel. Do not release the water used during cleanup into sewers, drains, or surface water. Follow applicable OSHA regulations (29 CFR 1910.120).

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

RCA Hazardous Waste (40 CFR 261.33): Not listed

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 100 lb (45.4 kg) [* per Clean Water Act, Sec. 311(b)(4)]

Listed as a SARA Extremely Hazardous Substance (40 CFR 355), Reportable Quantity: 100 lb; Threshold Planning Quantity (TPQ): 500 lb

Listed as a SARA Toxic Chemical (40 CFR 372.65)

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

Respirator: Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA.

Warning: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent any skin contact.

Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the OSHA PEL, ACGIH TLVs, and NIOSH REL (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.⁽¹⁰⁾

Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store cylinders or tanks in a cool, well-ventilated, fire-resistant location away from oxidizing agents, combustible materials, incompatible materials (especially chlorine, bromine, iodine, and acids), heat and ignition sources, and exit points. Special outside storage out of direct sunlight is preferred. Protect containers from physical damage. Follow good practice for handling compressed gas in cylinders.

Engineering Controls: Work practices and equipment must be designed to prevent skin and contact with ammonia or ammonia solutions and inhalation of gaseous vapor. Provide workers with training on safe handling. Do not use ammonia near heat and ignition sources. All engineering systems should be of maximum explosion-proof design and electrically grounded and bonded. Cylinders in use should be in enclosed cabinets equipped with an individual air ventilation source to control accidental leaks. Do not use copper, brass, bronze, or galvanized steel in contact with ammonia. Welded, not threaded, joints are preferred in ammonia service. Do not use brazed joints. Iron and steel construction is preferred. Piping should be of rigid steel. Follow OSHA regulations (29 CFR 1910.11).

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Ammonia, anhydrous

DOT Hazard Class: Nonflammable gas

ID No.: UN1005

DOT Label: Nonflammable gas

DOT Packaging Requirements: 173.304, 173.314

DOT Packaging Exceptions: 173.306

IMO Shipping Name: Ammonia, anhydrous, liquified, or ammonia solutions, density (specific gravity) less than 0.880 at 15 °C, in water, containing more than 50% ammonia

IMO Hazard Class: 2.3

IMO Label: Poison gas

IMDG Packaging Group: -

ID No.: UN1005

MSDS Collection References: 1, 2-9, 12, 17, 19, 20, 24, 26, 27, 31, 38, 73, 84, 85, 87, 88, 103, 109, 123, 124, 126, 127, 129, 133, 134, 136

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